Section 3.7
ENERGY AND NATURAL RESOURCES

This section describes the existing energy and natural resources in the area of the proposed Wild Horse Wind Power Project (WHWPP) in Kittitas County near the City of Kittitas. It evaluates the potential impacts of the project on those resources and identifies mitigation measures to limit the impacts. The analysis in this section is primarily based on information provided by the Applicant in the ASC (Wind Ridge Power Partners LLC 2004, Section 3.15). Where additional information has been used to evaluate the potential impacts associated with the proposal, that information has been referenced.

3.7.1 Affected Environment

3.7.1.1 Energy Resources

Project Area Energy Resources

Puget Sound Energy (PSE) and Kittitas County Public Utility District (PUD) No. 1 provide electrical services in the county, except for within the City of Ellensburg, which provides electrical service within its boundaries. The sources of this power are primarily the Columbia River hydroelectric facilities such as the Bonneville Power Administration (BPA) and Wanapum Dam operated by the Grant County PUD (Kittitas County 2002a).

Three high-voltage transmission lines pass near the project site. The BPA Columbia to Covington 230 kV line and the Grand Coulee to Olympia 287 kV line run east to west and are located approximately 14 miles northwest of the project boundary. The PSE Inter-Mountain Power (IP line) 230 kV electrical transmission line runs east to west and is located approximately 4.5 miles southwest of the project boundaries. The Applicant has submitted requests for transmission interconnection services for the project to both PSE and BPA (BPA 2003).

- If connected to PSE's system, the project would interconnect with PSE's Inter-Mountain Power 230 kV line via feeder line running south from the project (Figure 1-2).
- If connected to BPA's system, the project would interconnect with the Columbia to Covington 230 kV or with the Grand Coulee to Olympia 287 kV lines via feeder line running west from the project (Figure 1-2).

Northwest Region Energy Resources

Regional Demand

Electricity demand for the NWPCC's four-state Pacific Northwest planning region (Washington, Oregon, Idaho, and Montana) was 20,080 average megawatts in 2000 (NWPCC 2003). The NWPCC's recently revised 20-year demand forecast shows that electricity demand in the region will grow from 20,080 average megawatts in 2000 to 25,423 average megawatts by 2025 (medium forecast), an average annual growth rate of just less than 1% per year (see Table 3.7-1). While this forecast indicates that the most likely range of demand growth (between the medium-low and medium-high forecasts) is between 0.4 and 1.50% per year, the low to high forecast range recognizes that growth as low as -0.5% per year or as high as 2.4% per year is possible, although relatively unlikely (NWPCC 2003).

Table 3.7-1. Projected Pacific Northwest Electricity Demand, 2000–2025

Forecast Scenario	Electricity Demand (Average Megawatts)			Growth Rates (Percentage of Change)	
	2000	2015	2025	2000–2015	2000–2025
Low	20,080	17,489	17,822	-0.92	-0.48
Medium Low	20,080	19,942	21,934	-0.05	0.35
Medium	20,080	22,105	25,423	0.64	0.95
Medium High	20,080	24,200	29,138	1.25	1.50
High	20,080	27,687	35,897	2.16	2.35

Source: NWPCC 2003.

BPA Transmission System

The BPA owns and operates 15,000 miles of power lines that carry power from the dams and other power plants to utility customers throughout the Pacific Northwest. The service area includes Oregon, Washington, Idaho, western Montana, and small portions of Wyoming, Nevada, Utah, California, and eastern Montana.

The BPA owns and operates the Federal Columbia River Transmission System (FCRTS), which accounts for more than three-fourths of the high-voltage transmission grid in the Pacific Northwest, as well as extra regional transmission facilities. This transmission system fulfills the requirement for generation resources to be interconnected to a high-voltage electrical transmission system to deliver power from generation facilities to loads both within and outside the Pacific Northwest purchasing retail utilities. .

About half the power that the BPA sells goes to Northwest public utility districts, city light departments, and rural electric cooperatives, with public agencies getting preference for power. Approximately 25% of BPA's annual revenues is generated by northwest aluminum companies and a few other large industries. BPA sells surplus power to utilities outside the region after customers in the Northwest are served.

According to BPA, power deliveries are being affected by chronic congestion on a number of critical transmission paths, caused by portions of the Northwest transmission system that are approaching gridlock. In response, BPA has had to limit wholesale power trading, which in turn drives up prices for all consumers in the West. Approximately 1,000-MW of generation projects under construction had contracted for transferring power over the BPA system as of 2001. An additional 3,000-MW of new generation is proposed by 2004, and developers have requested interconnection for nearly 30,000-MW of generation. Although many of the proposed generation projects are not expected to be constructed, BPA has determined that a transmission capacity shortfall of approximately 3,000-MW would occur by 2004 (BPA 2001).

Puget Sound Energy Transmission System

PSE operates and maintains an extensive electric system consisting of generating plants, transmission lines, substations, and distribution equipment. Its facilities include approximately 303 substations, 2,901 miles of transmission, 10,523 miles of overhead distribution, and 8,224 miles of underground distribution lines. PSE serves 958,000 electric customers within a nine-county, 4,500-square-mile service territory in the Puget Sound region. PSE is a private company whose electricity services are regulated by the Washington Utilities and Transportation Commission.

There are several congestion points in PSE's electrical transmission system. PSE's transmission system, along with the regional high voltage transmission system, is undergoing fundamental restructuring mandated by Federal Energy Regulatory Commission (FERC) initiatives:

- Orders 888 and 889 required all public utilities to file open access transmission tariffs that would make utilities' electric transmission systems available to wholesale sellers and buyers on a nondiscriminatory basis. PSE complied and gained FERC approval of its open access transmission tariff.
- Order 2000 encourages transmission-owning utilities to turn operational control of their high voltage power lines over to independent entities called Regional Transmission Organizations (RTOs), while still maintaining ownership of their power-grid assets and receiving revenues from their use.

Proposed Generation Projects

More than 10,000-MW of additional generation capacity (see Table 3.7-2), representing 39 new merchant power generation projects, was proposed in the state of Washington as of April 2003. While not all of these projects would be constructed additional generation capacity is likely to be added in the Northwest during the next two to three years. In 2002, over 1,100 MW of additional capacity has become operational in the region (see Table 3.7-3). Table 3.7-4 lists six additional projects under construction in Washington in late 2003 with their expected commercial operation dates (PSE 2003a).

Table 3.7-2. Proposed Generation Projects in Washington

Facility	Developer	Facility Type	Size (MW)
Bickleton	PacifiCorp Power Marketing, Inc.	Wind	150
Big Horn	PacifiCorp Power Marketing, Inc.	Wind	200
BP Cherry Point Cogeneration Project	BP West Coast Products	Combined Cycle/ Cogeneration	720
Columbia River 1	Nordic Electric, LLC	Combustion Turbine	100
Columbia River 2	Nordic Electric, LLC	Combustion Turbine	100
Columbia Wind Ranch [SCA terminated – dead]	Cielo Wind Power	Wind	80
Darrington	National Energy Systems Co.	Boiler/Cogeneration	15
Desert Claim	Desert Claim Wind Power LLC	Wind	180
Everett Delta Power Project[1]	FPL Energy, Inc.	Combined Cycle	248
Frederickson (USGECO)	PG&E Generating Co.	Combustion Turbine	100
Frederickson 2	EPCOR	Combined Cycle	290
Goldendale Smelter	Westward Energy LLC	Combined Cycle	300
Horse Heaven	Pacific Winds	Wind	150
Kittitas Valley	Sagebrush Power Partners LLC (Zilkha)	Wind	180
Klickitat Wind[1]	Klickitat County PUD/Wind Turbine Co.	Wind	15
Longview (Mint Farm Industrial Park)[2]	Mirant Corp.	Combined Cycle	286
Longview Power Station[1]	Continental Energy Services, Inc.	Combustion Turbine	290
Maiden Wind Farm	Washington Winds. Inc.	Wind	150
Morgan Stanley, Frederickson	Morgan Stanley Capital Group, Inc.	Combustion Turbine	324
Moses Lake	National Energy Systems Co.	Combined Cycle/ Cogeneration	306
Plymouth Generating Facility	Plymouth Energy LLC	Combined Cycle	306
Rainier	National Energy Systems Co.	Combined Cycle	306
Richland (COMPOW)	Composite Power Corp.	Combustion Turbine	2600
Roosevelt (SEENGR)	SeaWest Energy Group, Inc.	Wind	150
Roosevelt Landfill	PUD No. 1 of Klickitat County Intern	Combustion	13
Six Prong	SeaWest Energy Group, Inc.	Wind	150
Starbuck Power Project	Starbuck Power LLC	Combined Cycle	1300
Stateline Wind Project (Wash) Phase III	FPL Energy, Inc.	Wind	200

Facility	Developer	Facility Type	Size (MW)
Sumas Energy 2[1]	Sumas Energy 2, Inc.	Combined Cycle	660
Sumner (PG&E)	PG&E Dispersed Generating Co.,	Combustion Turbine	87
Tahoma Energy Center	Tahoma Energy Center, LLC	Combined Cycle	270
Underwood	PacifiCorp Power Marketing, Inc.	Wind	70
U.S. Electric Cherry Point	U.S. Electric Power	Coal	249
Waitsburg	SeaWest Energy Group, Inc.	Wind	100
Wallula Power Project[1]	Newport Northwest, LLC	Combined Cycle	1300
Washington (Elcap)	El Cap I	Combustion Turbine	10
Wild Horse Wind Power	Wind Ridge Power Partners (Zilkha)	Wind	165
Zintel Canyon[1]	Energy Northwest	Wind	50

Notes:
This project list represents an inventory of projects around the state in various stages of development, but is not intended to be all-inclusive.
[1] Project approved.
[2] Project approved; construction suspended.

Sources:KVWPP 2003, PSE 2003a

Table 3.7-3. Washington/Oregon Generation Facilities Constructed in 2002

Facility	Developer	Facility Type	Size (MW)	On-Line Date
Boulder Park	Avista Corp	Internal Combustion	25	5/31/2002
Centralia (TRAENE)	TransAlta Energy Corp.	Combined Cycle	248	8/12/2002
Frederickson Power	Frederickson Power (EPCOR)	Combined Cycle	248	8/19/2002
Hermiston	Calpine	Combined Cycle	630	6/1/2002
Klondike	Northwest Wind Power	Wind	25	4/30/2002
Nine Canyon Wind Project	Energy Northwest	Wind	50	9/25/2002

Source: KVWPP 2003, PSE 2003a

Table 3.7-4. Washington Generation Facilities Currently Under Construction in 2003

Facility	Developer	Facility Type	Size (MW)	On-Line Date
Chehalis Power	Tractebel Power, Inc.	Combined Cycle	520	Qtr. 3/2003
Coyote Springs 2	Avista	Combined Cycle	260	Qtr. 3/2003
Goldendale	Calpine Corp.	Combined Cycle	248	Qtr. 2/2004
King County Fuel Cell Plant	Fuel Cell Energy Inc.	Other	1	Qtr. 4/2003
Nine Canyon Expansion	Energy Northwest	Wind	15	Qtr. 4/2003
Satsop CT Project	Duke Energy	Combined Cycle	650	Construction Suspended

Source: KVWPP 2003, PSE 2003a

3.7.1.2 Nonrenewable Resources

Gravel mining, is the primary nonrenewable resource in the project vicinity. Several gravel pits and quarries are located near the project, and most of their output is used locally. This resource is mostly consumed by construction projects (sand, gravel, concrete, and other building products). Washington State is ranked seventh in the nation in annual tonnage of extracted sand and gravel.

Petroleum products are not produced in the project vicinity but are available through numerous commercial outlets in the project vicinity.

3.7.1.3 Renewable Resources

Materials that can be regenerated, such as wood, other fibers, wind, and sunlight are considered renewable resources. Wind is the primary renewable resource in the project area. The project site sustains a strong, thermally driven wind energy resource. Warm air rises over the arid area east of Ellensburg, and cooler air in the Cascades west of Cle Elum near Snoqualmie Pass is drawn through the Kittitas Valley over the project site in a chimney effect. The rapidly moving cooler air mass is accelerated by the project's ridgelines. The predicted 100-year peak wind gust in the Ellensburg area is 73 mph (Wantz and Sinclair 1981).

Several studies demonstrate that Washington has potential for generating electricity via wind power. The Pacific Northwest National Laboratory (formerly known as the Pacific Northwest Laboratory) of the Department of Energy has published estimates of the wind power resource available by state, and Washington is ranked in the bottom tier in terms of wind energy potential (Pacific Northwest Laboratory 1991a). Even so, the state could generate 3,700 average megawatts (aMW) of electricity from wind—more than one-third the total amount of electricity the state generated in 1998 (Pacific Northwest Laboratory 1991b). Similarly, the National Renewable Energy Laboratory (NREL) made more conservative estimates that Washington could generate 3,400 aMW of electricity from wind (NREL 1994). In 2002, four research organizations published a survey of renewable resources, which found 7,000 aMW of wind potential in Washington (Land and Water Fund of the Rockies et al. 2002). In a 2002 report contracted by the Northwest Energy Coalition, the Tellus Institute identified 1,900 aMW of wind energy potential in Washington looking only at the windiest and most developable locations (Tellus Institute 2002).

The Columbia River corridor along the Oregon-Washington border is an area of good wind energy potential that currently supports wind power projects, because the Columbia River Gorge provides a low-elevation connection between the maritime air of the Pacific Coast and continental air masses in the interior of the Columbia Basin east of the Cascade Range. Especially strong pressure gradients develop along the Cascades and force the air to flow rapidly eastward or westward through the gorge. Existing wind developments in this area include the 48-MW Nine Canyon Wind Farm in Benton County and the 300-MW Stateline Wind Project in Walla Walla County.

A strong wind energy resource is also sustained in the Ellensburg corridor in central Washington, where the WHWPP and other wind power projects are proposed. Exposed areas throughout the central Washington corridor have a Class 4 to 5 annual average wind resource with a Class 6 resource during the spring and summer seasons (Pacific Northwest Laboratory 1987). Areas designated Class 4 or greater are suitable with advanced wind turbine technology under development today according to the NREL.

Because of recent legislation, markets for renewable ("green") energy are growing in the Pacific Northwest. RCW 19.29A, Implementation of Retail Option to Purchase Qualified Alternative Power (signed into law in 2001) directed 16 Washington electric utilities to offer a voluntary "qualified alternative energy product," or green energy, starting in January 2002. The law defined "alternative energy resource" as electricity fueled by wind, solar energy, geothermal energy, landfill gas, wave or tidal action, or gas produced during the treatment of wastewater, qualified hydropower, or biomass. State staff surveyed Washington utilities and determined that local and regional markets for green power have been increasing (CTED and WUTC 2002). In particular, there has been a proliferation of requests from Pacific Northwest electric utilities to purchase wind power. Several electric utilities have recently issued RFPs to acquire wind power, including PSE, Avista Corporation, and Portland General Electric.

Kittitas Valley Alternative

Because the Kittitas Valley alternative is located in the same general vicinity as the WHWPP, the existing condition for energy and natural resources would be the same for both alternatives.

Desert Claim Alternative

Because the Desert Claim alternative is located in the same general vicinity as the WHWPP, the existing condition for energy and natural resources would be the same for both alternatives.

Springwood Ranch

Because the Springwood Ranch alternative is located in the same general vicinity as the WHWPP, the existing condition for energy and natural resources would be the same for both alternatives.

Swauk Valley Ranch

Because the Swauk Valley Ranch alternative is located in the same general vicinity as the WHWPP, the existing condition for energy and natural resources would be the same for both alternatives.

3.7.2 Impacts of Proposed Action

The project would consume limited amounts of energy and natural resources primarily during construction. Direct impacts would result from use of energy and natural resources such as fuel, water, and electricity to construct, operate and maintain, and decommission the project. Operation of the project will consume very limited amounts of natural resources, as the wind turbine generators will use wind, an abundant, naturally occurring renewable resource, to generate electricity. By using wind, rather than non-renewable fossil fuels, to generate electricity, operation of the project will help reduce overall consumption of non-renewable natural resources. Direct impacts associated with or attributable to specific project elements such as the proposed turbine towers, O&M facility, and substations are discussed below, where applicable. Indirect impacts on energy and natural resources are not anticipated because the project is not expected to substantially induce regional growth to the extent that would result in significant changes to offsite energy and fuel consumption. Table 3.7-5 summarizes potential energy and natural resource requirements under the three project scenarios. Potential water resource impacts are evaluated in more detail in Section 3.3, “Water Resources.”

Numerous independent life cycle analyses of wind power projects have shown that wind farms have a very high “energy payback” (ratio of energy produced compared to energy expended in construction and operation), and that wind's energy payback is higher than that of thermal power plants. Several studies have found that it generally takes fewer than six months of operation for a wind farm to produce the total amount of energy used to construct the equipment and build the project. (Energy Center of Wisconsin 1999, Grum-Schwensen 1990, Hagedorn et al. 1991, Gydesen. et al. 1990.)

The consumption of energy and material quantities of consumables involves the following:

- The consumption of electricity and natural resources to produce the durable equipment and construction supplies used to build the project;
- The consumption of electricity during construction and operation;
- The consumption of gasoline and diesel fuel for motor vehicles during construction and operations; and
- The consumption of lubricating oil, greases, and hydraulic fluids for operating Project equipment controls and for providing lubrication of moving parts in wind turbine generators.

Table 3.7-5. Summary of Potential Energy and Natural Resources Requirements

Component	104 Turbines/3-MW	136 Turbines/1.5-MW (Most Likely Scenario)	158 Turbines/1-MW
Construction Impacts			
Electricity Consumption	0	0	0
	(Electricity provided by portable generators)	(Electricity provided by portable generators)	(Electricity provided by portable generators)
Diesel Consumption	150,000 gal	150,000 gal	150,000 gal
Gasoline Consumption	30,000 gal	30,000 gal	30,000 gal
Sand Use	37,200 cu yd	38,700 cu yd	39,000 cu yd
Gravel Use (aggregate)	244,300 cu yd	246,600 cu yd	246,900 cu yd
Water Consumption	10,500,000 gal	10,700,000 gal	10,800,000 gal
Cement Use			
Tower foundations	31,000 cu yd	30,000 cu yd	36,000 cu yd
Steel Consumption			
Turbine towers	15,000 tons	12,000 tons	14,000 tons
Tower foundations	2,100 tons	2,200 tons	2,500 tons
Operation and Maintenance Impacts			

Component	104 Turbines/3-MW	136 Turbines/1.5-MW (Most Likely Scenario)	158 Turbines/1-MW
Electricity Consumption	< 1% of total project output will be pulled from grid.	< 1% of total project output will be pulled from grid.	< 1% of total project output will be pulled from grid.
Fuel Consumption	11,500 gal	11,500 gal	11,500 gal
Water Consumption	<1,000 gal daily at O&M facility	<1,000 gal daily at O&M facility	<1,000 gal daily at O&M facility
Wind Turbine Generator Fluid Quantities:			
Glycol-water mix	55 gal (5,720 gal total)	40 gal (5,440 gal total)	30 gal (4,470 gal total)
Hydraulic fluid	85 gal (5,893 gal total)	65 gal (5,893 gal total)	45 gal (4,470 gal total)
Lubricating oil	110 gal (11,440 gal total)	90 gal (12,240 gal total)	70 gal (11,060 gal total)
Substation Transformer Mineral Oil	500 gal per transformer (68,000 gal total)	500 gal per transformer (68,000 gal total)	500 gal per transformer (68,000 gal total)
Pad-Mounted Transformer Mineral Oil	12,000 gal per transformer, up to 24,000 gallons	12,000 gal per transformer, up to 24,000 gallons	12,000 gal per transformer, up to 24,000 gallons
Decommissioning Impacts			
	Similar to those described for construction	Similar to those described for construction	Similar to those described for construction

Notes:

Estimated quantities are rounded.
Assumes 10 construction weeks for roads & foundations.
Assumes gas-powered vehicle consumption at 20% of diesel consumption.
Assumes 60/40 gravel/sand concrete mix.
Assumes construction office will be powered by diesel generator.

Sources: Wind Ridge Power Partners LLC 2004

3.7.2.1 Construction Impacts

Estimates for materials consumed during construction are summarized in Table 3.7-5.

As described in Section 3.1.2 "Earth – Impacts of the Proposed Action," there is no change to the length or width of project components, including roads, substations, O&M facilities, rock quarries, underground or overhead lines, permanent met towers, batch plant, or rock crusher under the different turbine size scenarios. These components comprise the vast majority of acreage impacted by the project, and because they remain unchanged under all scenarios, the total acreage and construction quantities are very similar under all scenarios. This is because the scenarios utilize a similar layout, with greater or fewer WTGs along each string, but with the same beginning and end points for each string. For a specific comparison of the relative areas impacted under each scenario, refer to Table 3.1.1: "Summary of Potential Earth Resource Requirements and Impacts."

The construction impacts are also substantially similar under the different design scenarios. There is no significant change to peak and total earthmoving quantities, or to peak and total production volumes at the batch plant or rock crusher. This is because the 104-Trubine/3-MW Scenario utilizes larger foundations for a smaller number of WTGs, while the 158-Turbine/1-MW Scenario utilizes smaller foundations for a larger number of WTGs.

Table 3.7-5 illustrates the variance in quantities consumed under the different scenarios. The maximum variance (either increase or decrease) from the 136-Turbine/1.5-MW (Most Likely) scenario is a change of 3.9%.

Energy Resources Consumed

The proposed wind turbines and associated facilities, including access roads and underground and overhead collection infrastructure, would be constructed using materials that require energy for their production. Energy would also be required to transport these materials to the project site and to operate construction equipment such as cranes, trucks, tools, and vehicles. Energy consumption is predominantly in the form of gasoline, diesel fuel, and electricity (Table 3.7-5).

Electricity Sources

Substantial amounts of electricity are not required during project construction. Portable generators would produce the electricity required for construction activities. The level of electrical energy consumption required during project construction would not significantly affect locally available energy resources.

Fuel Sources

Fuel consumption during construction would be approximately 180,000 gallons (diesel and gasoline from Table 3.7-5) for mobile construction equipment, construction vehicles, and generators for the three project scenarios. Fuel for construction equipment would be supplied by existing licensed fuel distributors or local gas stations near Kittitas or Ellensburg. For construction vehicles on site, temporary refueling stations will be established at on-site fuel storage tanks dedicated to vehicle refueling. Section 2.2.3, “Project Facilities” describes the fuel storage tanks in detail. The level of fuel products consumed during project construction would not significantly affect locally available resources.

Natural Resources Consumed

Water Sources

Approximately 10.7 million gallons of water would be consumed for dust suppression and other construction purposes. The portable concrete batch plant and portable rock crusher require potable-quality water for machinery and dust-control water spray function. Similarly, water tanker trucks equipped with spray nozzles for dust control will utilize potable quality water to reduce the possibility for clogging valves and nozzles. Water consumed during construction activities will be purchased by the EPC contractor from an off-site vendor with a valid water right and transported to the site in water-tanker trucks as described in Section 3.3.2, “Water—Impacts of the Proposed Action.” The City of Kittitas has confirmed in writing its interest as one possible water vendor for the project, and would supply potable water from the City’s water tower or standby well for all construction purposes, including dust control (See “Letter of Interest from City of Kittitas” in Appendix A). The City has confirmed that supplying all of the project’s water requirements would not cause any significant impact on the its public water supply, even if the period of highest water use occurred during the summer months. Therefore, project construction would not significantly affect locally available resources.

The amount of water required for dust control is highly dependent on whether a dust palliative such as lignin is used as well as timing and weather. If lignin or another environmentally safe, non-toxic dust palliative is used, the amount of water used for dust control would be reduced by an estimated 50%.

Steel

Steel would be required to construct the turbines and towers. The estimated total amount of steel required would range from 14,200 tons under the 136-Turbine/1.5-MW scenario to 17,100 tons under the 104-Turbine/3-MW scenario. Steel used during construction activities would be supplied by the appropriate distributors and vendors and transported to the site. The project's steel requirements during construction would not significantly affect local supply.

Cement, Sand, Aggregate, and Gravel Sources

Cement, sand, and some aggregate will be purchased from existing suppliers in the area that operate permitted quarries. Concrete would be consumed to build turbine foundations. The estimated amount of concrete required for project construction would range from 30,000 cubic yards (under the 136-Turbine/1.5-MW-scenario) to 36,000 cubic yards (under the 158-Turbine/1-MW scenario). Gravel (aggregate) would be used to construct roads, turbine and crane pads, and other project facilities such as the O&M facility, substations, turn-around areas, and meteorological towers. The estimated amount of gravel required for construction would range from 244,300 cubic yards under the 104-Turbine/3-MW scenario to 246,900 cubic yards under the 158-Turbine/1-MW scenario. The on-site gravel pits and their locations are described in Section 2.2.3, "Project Facilities."

The impacts on nonrenewable resources under the three project scenarios would vary depending on the specific resource. The project's resource requirements during construction would not significantly affect local supply.

Grazing Land

The permanent footprint of the project will remove approximately 165 acres from open space and grazing uses for the life of the project (at least 20 years). The remaining approximately 8,400 acres within the project boundary will remain undeveloped, and may or may not allow grazing as discussed in Section 3.9, "Land Use." At a maximum, the removal of approximately 5,300 acres of land from the approximately 445,000 acres of pasture or unimproved grazing land in Kittitas County (Kittitas County Comprehensive Plan 2003) would represent a reduction of 1.2%.

Petrified Forest Deposits

There appears to be no relationship between this site and the ginkgo petrified forest resources. No petrified wood deposits similar to the ginkgo deposits located in the Ginkgo Petrified Forest State Park (approximately 5 miles from the project site) have been discovered at the project site, and no petrified ginkgo was observed during the geotechnical reconnaissance work at the project site. The likelihood that any such resources would be affected by the project is low, given the relatively small disturbed area within the project site.

The Ginkgo Petrified Forest State Park is described in Section 3.10.2.1, "Visual Resources Light and Glare—Existing Conditions Regional and Local Landscape Settings." Because the project will not be visible from the portions of the park in which there are developed facilities (see Section 3.10.2.), the project will have little impact on the aesthetic experience of park users.

3.7.2.2 Operation and Maintenance Impacts

The consumption of energy and natural resources during operations would be generally the same for any of the proposed scenarios, with the exception of annual quantities of maintenance fluids (lube oil and cooling fluid), which are presented in Table 3.7-5. The amount of power generated would be greater with the 104-Turbine/3-MW scenario (312-MW of nameplate capacity) as compared to the other scenarios.

Operation of the project would consume very limited amounts of energy and non-renewable natural resources (Table 3.7-5). Energy will be generated using the kinetic energy in wind, transformed by the wind turbine generators into useful electricity. Types and quantities of energy and natural resources consumed during operations will consist primarily of the following:

- Fuel for O&M vehicles: Annual consumption is expected to be about 11,500 gallons.
- Lubricating oils, greases and hydraulic fluids for the wind turbine generators: Annual consumption is expected to be about 18,000 gallons of lube and hydraulic oils and approximately 5,500 gallons of cooling fluid.
- Water for domestic use at the O&M facility and incidental maintenance uses: Use is expected to be substantially less than 1,000 gallons/day.
- Electricity for project operations: The project will generate power output approximately 80% of the time and will consume a small amount of electricity from the grid during periods of low wind as station stand-by power. The project is estimated to consume less than 1% of project energy generation. The project would generate 67 aMW of electricity annually and would increase the availability of renewable energy in the Pacific Northwest.
- Wind Integration: In order to be interconnected to either the BPA or PSE grids, the project will require an interconnection and transmission agreement which complies with FERC and National Electric Reliability Council (NERC) standards. This ensures the safe and reliable delivery of power from the project to the grid. Power from the project will be integrated into the overall grid system, which is handled by BPA and/or PSE system operations groups who are responsible for scheduling and managing their respective grid control areas. By definition, the injection of power to the grid from any power project does not consume power. In order to maintain system balance during periods of high wind power output from the project, system operators will be able to reduce the amount of other power being injected into the grid from other sources. Hourly power output fluctuations from the project are typically less than 30% of nameplate capacity, which is significantly smaller than load swings on either the BPA or PSE systems.

Sources of Natural Resources Used During Operation

Fuel used for O&M vehicles will be purchased from local gas stations. Lubricating oils and hydraulic fluids used for wind turbine generator maintenance will be purchased from distributors of such materials. The final selection of these distributors will depend on the specific turbine model chosen for the project.

Electricity for project operations will mostly be generated by the project itself. During periods when the wind turbines are not generating power; it will be purchased from the regional utility.

Water consumed during operations would be purchased from a local vendor with a valid water right and transported by a water tanker truck. The supply requirement is estimated at a maximum of 1,000 gallons per day for domestic usage and light maintenance duties.

3.7.2.3 Decommissioning Impacts

Impacts attributable to energy consumption during project decommissioning would be similar to those described for the construction phase of the project. Water would still be required, but only as a dust control measure. No steel, cement, gravel, or sand would be required during decommissioning. Energy consumption, predominantly in the form of gasoline, diesel fuel, and electricity, would be required to operate equipment such as cranes, trucks, tools, and vehicles used to dismantle and remove most project facilities and reclaim disturbed areas. Demolition or removal of equipment and facilities would occur, to the extent necessary, to salvage economically recoverable materials such as steel towers. Dismantling would also eliminate the need for maintenance requirements (i.e., fuel, O&M facility water, gear oil, hydraulic fluid, glycol-water mix coolant). Therefore, no significant impacts from decommissioning are anticipated.

3.7.3 Impacts of Alternatives

3.7.3.1 Impacts of Off-Site Alternatives

Kittitas Valley Alternative

Resources used in the construction of this alternative would be the same or similar to those used for the WHWPP since both are wind power plant construction projects. Project construction would use materials that require energy for their production. Energy (gasoline, diesel fuel, and electricity) would also be required to transport these materials to the project site and to operate construction equipment, with an estimated 25,000 gallons of diesel and gasoline consumed. Portable generators would produce the electricity required for construction activities. Other nonrenewable resources used in construction would include water, steel, concrete, and gravel (aggregate). During construction, an estimated 7 million gallons to 9 million gallons of water would be used. An estimated 11,000 to 13,000 tons of steel would be required to construct the turbines and towers. With an additional 1,600 to 2,400 tons used for tower foundation reinforcement; 25,000 to 35,000 cubic yards of concrete would be consumed to build roads, crane pads, and turbine foundations; and 145,535 to 186,325 cubic yards of gravel (aggregate) would be required to construct roads, turbine and crane pads, and other project facilities. This is less than the estimated amounts of these materials that would be used under the proposed action

Operation and maintenance of the project would consume nonrenewable natural resources including fuel, electricity, water, lubricating oils, greases, and hydraulic fluids and with the exception of petroleum products, the amounts of these resources used would be similar to the WHWPP. The Kittitas Valley alternative would use an estimated 8,500 gallons of petroleum products per year, which is less than the amount estimated for the WHWPP. The project would use the kinetic energy in wind and transform it by the wind turbine generators into electricity. The project would generate 60 aMW of electricity annually and would increase the availability of renewable energy in the Pacific Northwest. Electricity for project operations would mostly be generated by the project itself. During periods when the wind turbines are not generating electricity, power would be purchased from the regional utility.

Desert Claim Alternative

Specific data for energy and natural resource use is not available for this alternative, however the types of resources used would be similar to those used in the WHWPP and the Kittitas Valley alternative, since all are wind power plant construction projects. Based on this alternative having a maximum of 120 turbines, it is estimated that materials used would be in the mid-range of values described for the WHWPP, which would have 104, 136, or 158 turbines, depending upon the scenario selected. Operation and maintenance impacts on energy and natural resources would also be expected to be within the range described for the WHWPP. The project would generate 59 aMW of electricity annually and would increase the availability of renewable energy in the Pacific Northwest.

Springwood Ranch

Specific data for energy and natural resource use is not available for this alternative; however, the types of resources used would be similar to those used in the WHWPP and the Kittitas Valley alternative, since all are wind power plant construction projects. Based on construction of 40 to 45 turbines under this alternative, use of natural resources for construction, operations, and maintenance is expected to be less than the WHWPP, and the Kittitas Valley and Desert Claim alternatives. The project would generate 20-25 aMW of electricity annually and would increase the availability of renewable energy in the Pacific Northwest.

Swauk Valley Ranch

Specific data for energy and natural resource use is not available for this alternative, however the types of resources used would be similar to those used in the WHWPP and the Kittitas Valley alternative, since all are wind power plant construction projects. Based on estimated construction of 42 turbines under this alternative, use of natural resources for construction, operations, and maintenance is expected to be less than the WHWPP, Kittitas Valley, and Desert Claim alternatives and similar to the Springwood Ranch alternative. The project would generate 21 aMW of electricity annually and would increase the availability of renewable energy in the Pacific Northwest.

3.7.3.2 Impacts of No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated, and the environmental impacts described in this section would not occur. The No Action Alternative assumes that future development would comply with existing zoning requirements for the project area, which is zoned Commercial Agriculture and Forest and Range. According to the County's zoning code, the Commercial Agriculture zone is dominated by farming, ranching, and rural lifestyles, and permitted uses include residential, greenhouses, and agricultural practices. Permitted uses in the Forest and Range zone include logging, mining, quarrying, and agricultural practices, as well as residential uses (Kittitas County 1991). However, if the proposed project is not constructed, it is likely that the region's need for power would be addressed by user-end energy efficiency and conservation measures, by existing power generation sources, or by the development of new renewable and non-renewable generation sources. Baseload demand would likely be filled through expansion of existing, or development of new, thermal generation such as gas-fired combustion turbine technology. Such development could occur at conducive locations throughout the state of Washington, and impacts on energy and natural resources could be similar to or even greater than the proposed action depending on the location, type, and magnitude of development at the project site. The significance of such impacts would depend on the site-specific location and project design.

A baseload natural gas-fired combustion turbine would have to generate 67 average-MW of energy to replace an equivalent amount of power generated by the project (204-MW at 33% net capacity). (An average-MW or "aMW" is the average amount of energy supplied over a specified period of time, in contrast to "MW," which indicates the maximum or peak output [capacity] that can be supplied for a short period.) See Section 2.7, "No Action Alternative."

3.7.4 Mitigation Measures

As the project would have a positive impact overall on the use of non-renewable resources, no mitigation is necessary or proposed.

3.7.4.1 Conservation and Renewable Resources Measures

During construction, conservation measures will include recycling of construction wastes where possible and encouraging carpooling among construction workers to reduce emissions and traffic.

The Applicant proposes several conservation measures that will be undertaken during operations:

- The O&M facility will utilize station power for electricity needs.
- Water usage at the site will be closely monitored during operations due to the limited capacity of the on-site water storage tank.
- Carpooling among operations workers will be encouraged.
- High-efficiency electrical fixtures and appliances in the O&M facility and substation control house will be used.
- Low-water-use flush toilets will be used in the O&M facilities

- Recycling of waste office paper and aluminum will be encouraged.

3.7.5 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts to energy and natural resources are expected as a result of the Wild Horse Wind Power Project.